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# PATENT SPECIFICATION

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(19)



## (54) GROOVE AND KNIFE FOLDING CYLINDER TYPE FOLDING APPARATUS

(71) We, ALBERT-FRANKENTHAL AKTIENGESELLSCHAFT, a German body corporate, of Johann-Klein-Strasse 1, 6710 Frankenthal/Pfalz, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to folding apparatus for use, for example, with rotary printing presses and of the groove-and-knife type of which the effective diameter of the cylinder is variable by rotation of a cam plate.

One known form of such apparatus has a folding cylinder with a peripheral wall subdivided into segments in the circumferential direction and an adjusting device which varies the position of the segments in a radial direction to vary the effective diameter of the cylinder and the segments are in the form of spring steel bows distributed around the cylinder and extending between the folding groove and the folding knife bars. A plurality of such supports, each formed by four segments are arranged one behind another in an axial direction, each segment being carried by two holders hinged to levers secured to rotatable spindles and subjected to an initial stress produced by torsion springs which urge the bows radially outwardly, and adjusting levers, mounted on the spindles at the end face of the cylinder, each abutting, under the pressure of the torsion springs, a respective curved step of a rotatable stepped cam plate.

Such known folding groove and knife cylinders combine a margin of safety against damage by virtue of the resilience of the steel bows, with the ensuring of satisfactory folded products by adapting, by means of the steel bows, the effective diameter of the outer periphery of the cylinder to that required for different batch thicknesses of the sheets to be folded which occur with different numbers of sheets.

In the known apparatus of the foregoing type, the stepped cam plate is rotatably mounted on a bearing ring at the end face of

the cylinder and is rotatable in the circumferential direction by means of an adjusting screw the thread of which engages in a screw-threaded bore in a bolt which is loosely mounted in the stepped plate, the adjusting screw being rotatably secured to the cylinder in a sleeve. Thus, the steel bows can be adjusted to vary the effective diameter of the periphery of the cylinder only when the machine is not running.

The object of the present invention is to so design the adjusting means that they may be adjusted even when the machine is running. The invention is based on the knowledge that it is thus possible to optimally adapt the diameter of the cylinder more rapidly, more reliably, and with the required sensitivity, to the thickness of the batch of sheets which is being processed, so that accurate running is ensured and satisfactory folded products are obtained.

In accordance with the invention, there is provided folding apparatus of the groove-and-knife folding cylinder type of which the effective diameter of the cylinder is variable by rotation of a cam plate relative to the cylinder wherein there is provided an adjustment member arranged to be displaceable axially of the cylinder while the cylinder and cam plate are rotating together to impart a degree of relative rotation between the cam plate and the cylinder proportional to the extent of displacement of said adjustment member whereby the effective diameter of the cylinder may be adjusted while the cylinder is rotating.

In a preferred embodiment of the invention, the adjustment member, which is longitudinally displaceable by means of a thrust ball bearing, carries spiral teeth which mesh with a spiral-toothed spur wheel which acts as the intermediate member and which in turn meshes with internal teeth on the stepped plate. The member is displaceable with respect to the side wall of the machine by means of a screw-threaded spindle and is fixable by means of a lock nut.

One embodiment of the invention is shown in the accompanying drawings as applied to a groove-and-knife folding cylinder of a folding apparatus.

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In the drawings:

Figure 1 shows a cross-section through the folding cylinder.

Figure 2 shows an end elevation with the adjustable stepped plate, and

Figure 3 shows a longitudinal section through the adjusting device.

The folding cylinder body 1 has a smaller external diameter than it should have in relation to the impression cylinder of the rotary press. For the purpose of adjusting the particular diameter required in conformity with the thickness of the batch of sheets, four segments in the form of adjustable spring steel bows 9 are arranged around the periphery and a plurality thereof in the axial direction. Spindles 4 and 4', associated with one another in pairs, are rotatably mounted in the cylinder 1 on the left and the right of the groove bars 2 and the fold knives 3. Levers 5, located in recesses in the fold cylinder, are clamped to the spindles 4 and 4' by means of screws 6. Holders 8 carrying the spring bows 9 are mounted on pivot pins 7 between the bifurcated ends of the levers 5.

Adjusting levers 10 are carried outside the cylinder body 1 by the spindles 4 and 4' and abut the stepped plate 12 under the force of torsion springs 11. The stepped plate 12 is rotatably mounted on the annular locating surface 13 and is axially secured by bolts 14 extending through longitudinal slots 14'.

A longitudinally displaceable member 18 is located within the cylinder axle 15 which is journaled on the side of the frame by means of bearings 16, the member 18 being secured to the axle 15 for common rotation by means of keys 19. An intermediate member 20, which is preferably in the form of a spiral-toothed spur wheel, meshes with spiral teeth 21 on the member 18 and also meshes with the stepped plate 12 by way of a toothed segment 22 and allows the stepped plate to rotate with the cylinder 1.

The end of the member 18 remote from the teeth 21 carries a ball bearing 23 acting as a rotary connection through which, after the lock nut 26 has been loosened, the member 18 can be longitudinally displaced by means of a handwheel 25 and a screw-

threaded spindle 24 supported on the side wall 17 of the frame, whereby relative rotation of the stepped plate 12 is effected by way of the spiral teeth 21. A self-locking servo motor may be provided instead of the handwheel 25, so that the lock-nut 26 is not required.

#### WHAT WE CLAIM IS:—

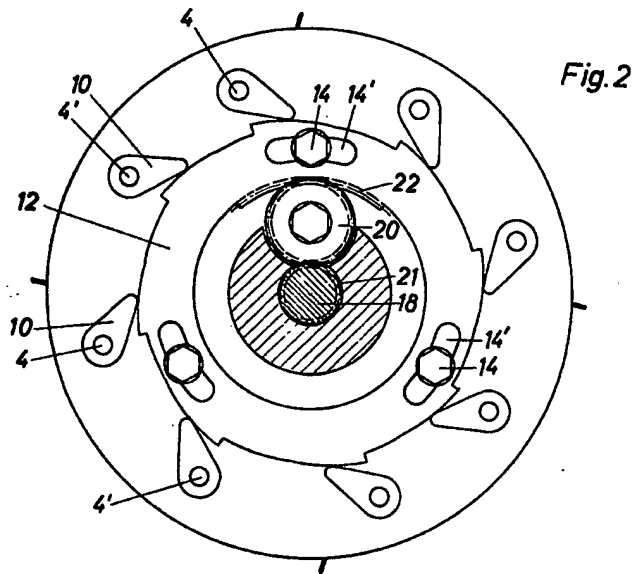
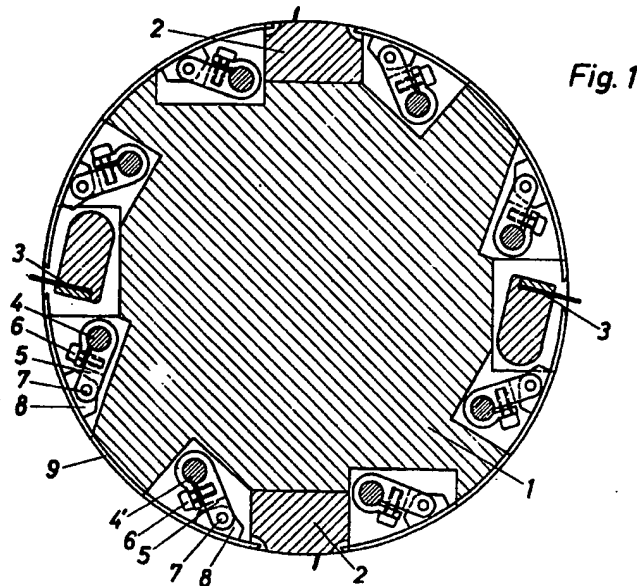
1. Folding apparatus of the groove-and-knife folding cylinder type of which the effective diameter of the cylinder is variable by rotation of a cam plate relative to the cylinder wherein there is provided an adjustment member arranged to be displaceable axially of the cylinder while the cylinder and cam plate are rotating together to impart a degree of relative rotation between the cam plate and the cylinder proportional to the extent of displacement of said adjustment member whereby the effective diameter of the cylinder may be adjusted while the cylinder is rotating.

2. Apparatus as claimed in claim 1 wherein the adjustment member comprises a shaft carrying spiral teeth which mesh with teeth of an intermediate member which in turn meshes with teeth on the cam plate, so that the cylinder, cam plate, intermediate member, and shaft, all rotate together and means is provided for displacing the shaft longitudinally, while it is rotating, to effect rotary adjustment of the cam plate relative to the cylinder.

3. Apparatus as claimed in claim 2 wherein said shaft is displaceably arranged in the axle of the cylinder and terminates at one end in a bearing housing which is displaceable, to move the shaft longitudinally, by rotation of a screw-threaded spindle engaging in a threaded bore in a fixed part of the apparatus.

4. Folding apparatus as claimed in claim 1 substantially as herein described with reference to the accompanying drawings.

A. C. ASHTON & CO.,  
Tower Buildings, Water Street,  
Liverpool.  
Agents for Applicants.



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COMPLETE SPECIFICATION

2 SHEETS

This drawing is a reproduction of  
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Sheet 2

